DNA FINGER PRINTING

CONTENTS

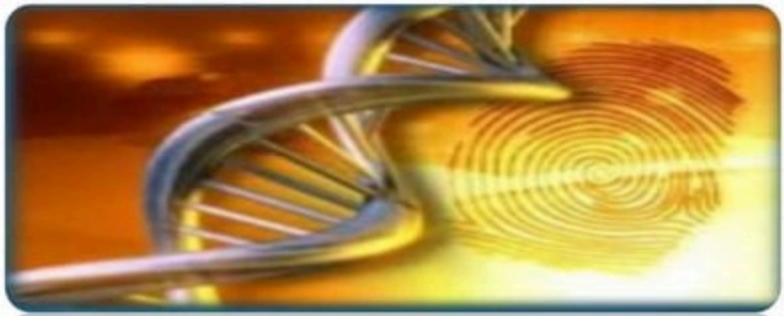
- Introduction
- Principle of DNA finger printing
- Method of DNA finger printing
- Determination of results
- Uses of DNA finger printing

INTRODUCTION

- The technique of DNA finger printing also known as DNA profiling .
- DNA fingerprinting was developed in 1984 by Alec. J. Jeffrey at the University of Leicester.
- In india ,DNA fingerprinting tests are carried out at centre for cell and molecular biology,Hyderabad.

What is DNA fingerprinting?

- The chemical structure of everyone's DNA is the same.
- The only difference between people (or any animal) is the order of the base pairs.
- The information contained in DNA is determined primarily by the sequence of letters along the zipper.



Principle of DNA finger printing

- The paternitiy dispute cases in india are referred to CCMB for DNA evidence.
- The first such test on DNA fingerprinting was applied in 1989 to settle down a disputed paternity case in madras.
- Monica Lewinsky and Madumita murder case have been solved through DNA fingerprinting technique.

- **The technique is based on the facts that –**

(1) DNA is unique to each individual

(2) Half of the DNA of each individual is derived from his mother and the other half from his father.

(3) No two persons in this world have identical DNA except indentical twins.

Sample collection

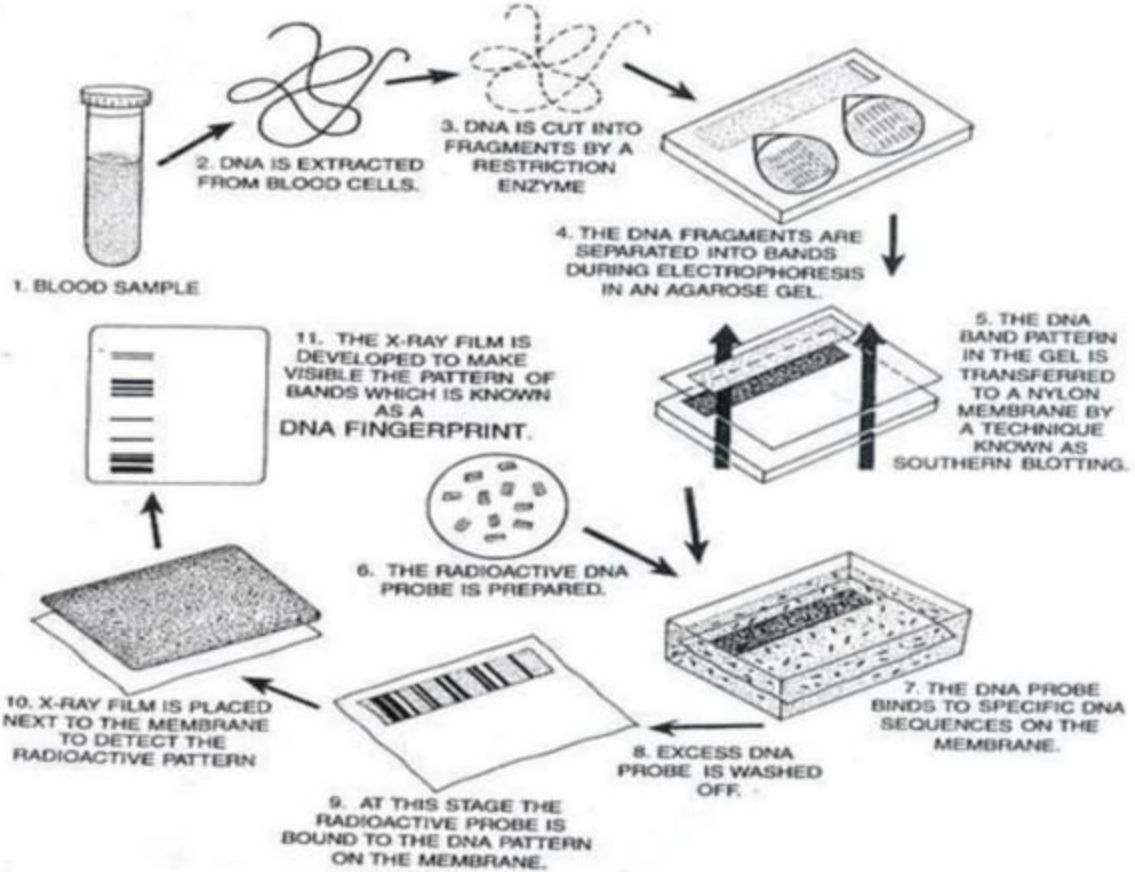


Fig. 6.40. The DNA Fingerprinting Process.

Method of DNA finger printing

- In DNA fingerprinting actually restriction fragment length polymorphism (RFLPs) are analysed and compared with suspects.

❑DNA fingerprinting is a laboratory procedure that requires seven steps :

(1) Extraction of DNA from sample tissue –

-First of all,a sample of tissue from which the DNA finger print is to be prepared is taken.

-This could be the blood of disputed child or seminal fluid from the body of the reped woman or a scalp hair from the assaiant.

- from these samples, the genomic DNA is extracted using suitable techniques.

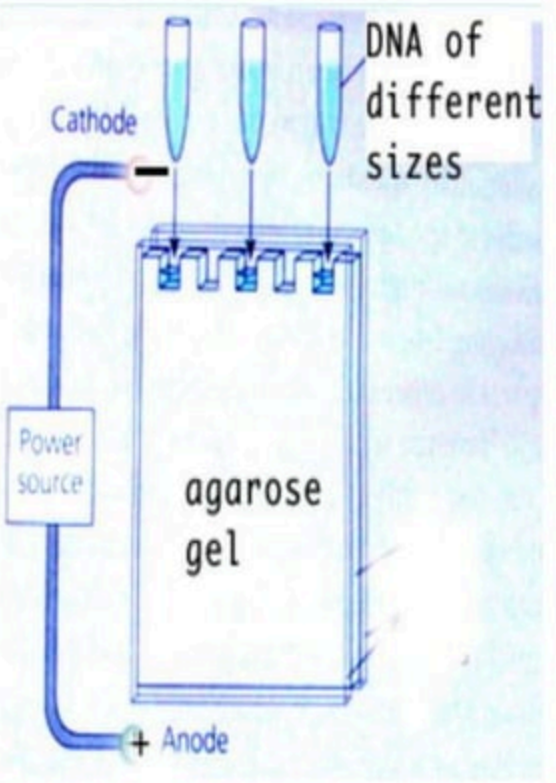
(2) Production of DNA fragments –

- The extracted DNA is treated with restriction enzymes to cut and produce fragments of unequal length (RFLPs).
- Restriction enzymes are special group of enzymes, normally present in bacterial cells, which cut the DNA only a specific sites.

(3) Separation of DNA fragments –

- The separation of DNA fragments (RFLPs) is done by gel electrophoresis technique in the form of invisible bands on gel.

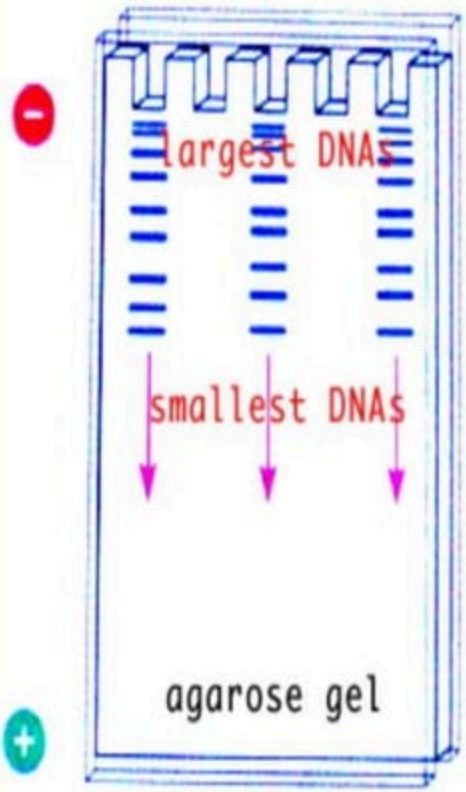
- During electrophoresis the fragments are put over agarose gel and an electric current of high voltage is applied.



- since the fragments have weak negative charge, they begin to move.

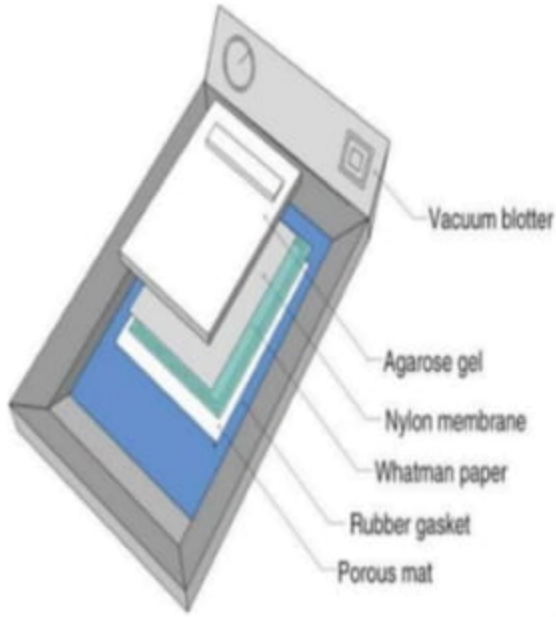
- The larger and heavier fragments move slower while the smaller and lighter fragments move faster.

- After sometime all the fragments get separated according to their lengths.



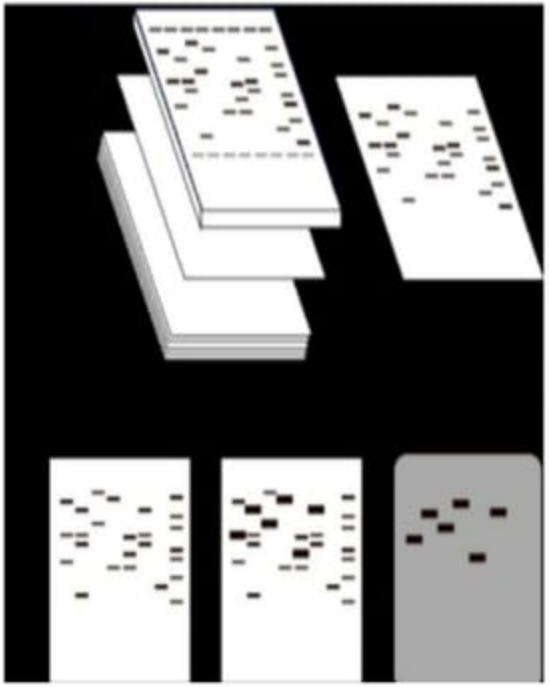
(4) Transfer of DNA fragment from gel to nitrocellulose paper –

- The transfer of DNA fragments from gel to nitrocellulose paper is done by the technique known as southern blotting.
- This technique is analogous to produce xerox copy of a printed page.
- In southern blotting technique, the agarose gel, containing invisible DNA fragments, is placed on a filter paper soaked in sodium saline citrate (SSC) solution which is also used in the preparation of DNA solutions.
- Now, a nitrocellulose strip is placed over the gel.
- The nitrocellulose paper is baked at 80C To fix DNA fragments.



(5) Preparation of Radioactive DNA probe –

- These DNA probes are special type of DNAs having definite sequence of bases and are used in the identification of specific genes or sequence of bases of other DNAs.
- A DNA probe can be compared with a dedicated sticker which sticks only to a specific DNA fragment like sticker at a fixed position or place on a paper.
- The DNA probes in India were developed by Lalji singh from the DNA of the females of the banded krait, a poisonous indian snake.

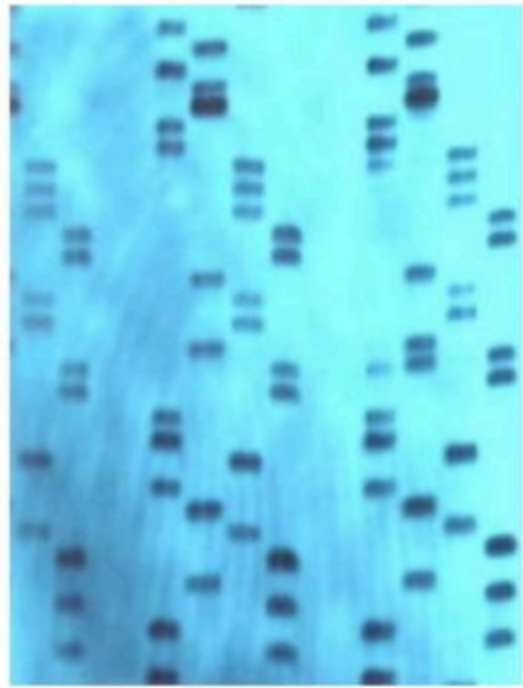


(6) Hybridization of DNA fragments with DNA probes on nitrocellulose paper-

- Hybridization of DNA fragments on nitrocellulose paper is performed by prepared radioactive DNA probes.
- For this purpose radioactive DNA probes in liquid medium are incubated in the nitrocellulose paper containing DNA fragments.

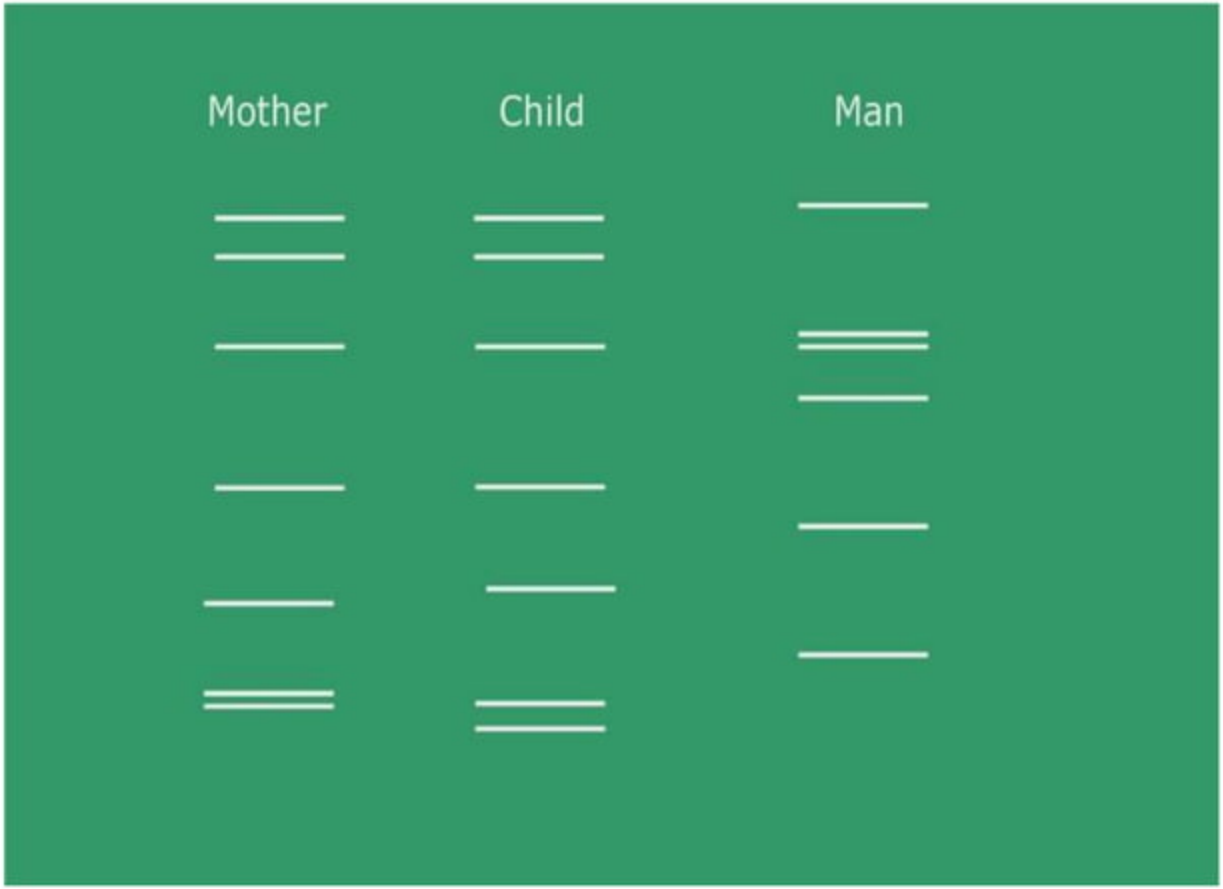
(7) Detection of hybrid DNA fragments –

- Hybridized DNA fragments can be detected through autoradiography.
- A radioactive material is added which combines with the DNA fragments to produce a fluorescent image.
- A Photographic copy of the DNA bands is obtained.



Determination of results

- For determination of parentage of a child, we make use of the that half of the DNA of a child comes from his mother and other half from his father.
- The half of the bands in the child's DNA finger print should correspond with those of its mother and the other half with those of its father.
- If some of the bands in a child's finger print do not correspond with either the alleged mother or the alleged father, it is certain that they are not its real parents.


Mother
Child
Man

Uses of DNA fingerprinting

- Forensic cases – matching suspect with evidence
- Paternity testing
- Identification of criminals (e.g. murderess, rapists, letter bombers)
- Immigration disputes (family relationship)
- Missing persons investigations
- Convicted felon DNA databases (CODIS)

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Thank You